Fully automated surveillance of Severe acute respiratory infections

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Introduction

Since the influenza pandemic of 2009, the WHO recommends every country to establish a national Severe Acute Respiratory Infections (SARI) surveillance system. The WHO defines SARI as an acute respiratory infection with a history of fever ≥ 38°C and cough with an onset within the past 10 days and for which hospitalization is necessary (1). SARI-surveillance system is supposed to generate near-real-time (weekly) data on the number of hospitalized patients with an acute respiratory infection (2-4). This surveillance system enables to determine the impact of epidemic and, in addition, allows early detection of epidemics and timely implementation of control measures. The current COVID-19 pandemic once again emphasizes the importance of such a surveillance system.

RIVM has performed a pilot study called "SARI surveillance, the missing link in the surveillance pyramid" to gain experience with different surveillance options. The case definition for SARI in this study was "a patient with an acute respiratory tract infection who was hospitalized based on clinical reasons for at least one night (5,6). The study investigated how, and with wat data, a SARI surveillance system can be established most efficiently in a demanding hospital environment. This experience taught us that a long-term SARI-surveillance system is preferably a fully automated system based on routinely collected data. This allows near-real-time monitoring and limits the administrative burden for hospital employees (7,8). The pilot study learned that financial codes used for claiming expenses at the healthcare insurance (DBC-care product codes), are currently the only routinely collected data suitable for an automated of SARI-surveillance in the Dutch situation (9, 10). These DBC-care product codes are unique codes for each diagnosis-treatment combination, containing information about the entire diagnostic and the treatment process and their use is mandatory for all hospitals in the country, as regulated by the Dutch Healthcare Authority (NZa). DBC-codes are assigned at admission but can be changed during hospitalization or even later. A study by the RIVM has shown a strong correlation between DBC care product codes and the internationally used International Classification of Disease (ICD) 10 codes (11). ICD10 codes are not available in real time and therefore not appropriate for surveillance purposes. In our SARI-surveillance system, DBC-careproduct codes including associated patient data will be supplemented and combined with microbiological test results.

Definitions

The case definition in the Dutch SARI-surveillance is "Hospitalization due to respiratory infection". The SARI-surveillance system will contain all hospital admissions whit a SARI-related DBC-code assigned and/or all admissions where SARI-related laboratory tests have been requested. Patients discharged within 24 hours after admission will be excluded, except in the event of death.

SARI-related DBC codes	
INT401	Pneumonia non-specified
INT409	Other unspecified respiratory infections
LON1401	Pneumonia
LON1405	Acute bronchitis
LON1241	COPD
KIN3104	Upper respiratory tract infection
KIN3208	Lower respiratory tract infection
KIN3210	RSV-bronchiolitis
KIN3202	Asthma/bronchial hyperresponsiveness

Only microbiological tests on influenza, RSV, SARS-CoV-2 and Streptococcus pneumoniae collected within the first 48 hours after admission are considered as SARI-related laboratory tests. Only patients with positive test results for one of the pathogens AND/OR a SARI-related DBC-care product codes are considered as SARI-admissions.

SARI-related laboratory tests	
Pathogen	**Tests**
Influenza A and B	Point of care test or other molecular laboratory test
RSV A and B	Point of care test or other molecular laboratory test
SARS-COV-2	Point of care test or other molecular laboratory test
Streptococcus pneumoniae	Urine antigen test

Inclusion filter:

SARI-specific DBC-code assigned at time of hospitalization AND/OR SARI-specific laboratory test within the first 48 hours after admission

- date of discharge ≠ admission date
- discharge date = admission date AND date of death = admission date
- Only initial hospital admissions are included, transfers from other hospitals are excluded.

Data collection

Participating hospitals will weekly provide an automatically generated file containing all SARI-patients of the past 4 weeks. Because DBC-codes can be adapted during treatment course due to revised diagnosis, surveillance output will be updated during the 3 consecutive weeks.

A week is being defined from Monday 0.00.00.000 to Sunday 23.59.59.999. This means that for week 9 in 2020, all SARI-related hospital admissions from Monday February 24th 2020 0.00.00.000 to Sunday March 1st 23.59.59.999 will be included. The datafile send in week 10 will contain all SARI-related hospital admissions of week 6, 7, 8 and 9 (between 3-2-2020 0.00.00.000 and March 1st 23.59.59.999).

Collected data

1. Hospital code
   - Each record will contain a code unique for each hospital to distinguish the treatment centers. Data on the participating centers will not be published individually.
2. Patient-identifiër
   - Unique code for each patient. Datafile can accommodate multiple rows for each patient when there are multiple labresults. Patient-identifier remains the same in subsequent records.
3. Admission date
   - Format: YYYYMMDD
4. DBC-care product code
5. Year of birth
6. Month of birth
7. ICU admission
   - Format: yes/no
8. Date of intensive care admission
   - Format: YYYMMDD
9. Microbiological test
   - Influenza, RSV, SARS-CoV-2, S. pneumoniae
10. Date of sample collection
11. Test result
    - Positive, negative, unknown/inconclusive
12. Typing
    - In case of influenza and RSV type A and B are being distinguished when possible.
13. Subtyping
    - Influenza subtype will be reported when possible.

Output

Based on the surveillance data, the weekly incidence of hospitalization due to respiratory infections per age category will be calculated. Incidence will be calculated based on the estimated catchment population for each participating hospital. This catchment population specific for respiratory infections is estimated once a year by dividing the number of hospitalizations due to respiratory infections per hospital by the total number hospitalizations due to these infections in the Netherlands (12). This calculation will be made based on ICD10 codes provided by the Dutch Hospital Data foundation (DHD) (13). The denominator will consist of all hospitalizations related to ICD10 codes J00-J22, A15, A16, A48.1, A70 and A78.

Based on the laboratory results the weekly percentage of patients positive for influenza, RSV, SARS-CoV-2 compared to total amount of sampled patients will be determined. Participating centers will receive weekly feedback of their hospital surveillance data and the aggregated data of all participating centers. This way hospitals are able to compare their situation with data nationwide. The weekly incidence of SARI-patients as well as the proportion influenza-, RSV-, SARS-CoV-2-, and pneumococcal positive samples will be reported at the website of the RIVM (14) and to the ECDC and WHO (15,16). Published data will consist of aggregated numbers and will be used for communication with (inter)national professionals, media and other interested parties.

References

1. Fitzner J, Qasmieh S, Mounts AW, et al. Revision of clinical case definitions: influenza-like illness and severe acute respiratory infection. *Bull World Health Organ*. 2018;96(2):122-128. doi:10.2471/BLT.17.194514

2. ECDC. Surveillance and studies in a pandemic: fourth meeting of the SSiaP working group 2009 [Available from: https://ecdc.europa.eu/sites/portal/files/media/en/publications/Publications/0908_MER_Surveillance_and_Studies_in_a_Pandemic_Meeting_Report.pdf.

3. van den Wijngaard CC, van Pelt W, Nagelkerke NJ, Kretzschmar 5.1.2e MP. Evaluation of syndromic surveillance in the Netherlands: its added value and recommendations for implementation. Euro surveillance : bulletin Europeen sur les maladies transmissibles = European communicable disease bulletin. 2011;16(9).

4. WHO. Global epidemiological surveillance standards for influenza. Geneva: World Health Organization; 2013.

5. Marbus SD, van Gageldonk-Lafeber AB, van der Hoek W, Schneeberger PM, Groeneveld GH, Polderman FN, et al. Onderzoeksprotcol: Severe acute respiratory infections, the missing link in the surveillance pyramid 2015-2019 [Available from: https://www.trialregister.nl/trial/5891.

6. Marbus SD, Oost JA, van der Hoek W, 5.1.2e, Polderman FN, de Jager CPC, et al. Ernstige acute luchtweginfecties: de ontbrekende bouwsteen in de surveillancepiramide. Nederlands Tijdschrift voor Medische Microbiologie. 2016;1(24):52-6.

7. Heuer AJ, Parrott JS, Percival D, Kacmarek RM. Examining the Phenomenon of the Administrative Burden in Health Care, Allied Health, and Respiratory Care. J Allied Health. 2016;45(2):152-6.

8. Lee LM TS, Thacker SB, St. Louis ME. Principles & practice of public health surveillance. New York: Oxford University Press; 2010.

9. Groeneveld GH, Dalhuijsen A, Kara-Zaitri C, Hamilton B, de Waal MW, van Dissel JT, et al. ICARES: a real-time automated detection tool for clusters of infectious diseases in the Netherlands. BMC Infect Dis. 2017;17(1):201.

10. Feitsma MK. Automated real-time surveillance in prospective monitoring of Severe Acute Respiratory Infections in children at the Wilhelmina Children's Hospital in Utrecht: a pilot study. 2019. Report No.: Internship at the department of Pediatric Immunology and Infectious Diseases, Wilhelmina Children's Hospital and National Institute for Public Health and the Environment (RIVM).

11. Nictiz. ICD-10 [Available from: https://www.nictiz.nl/standaarden/icd-10/.

12. Marbus SD, al. e. Incidence and cost of hospitalised adult influenza patients in the Netherlands: a retrospective observational study. submitted.

13. DHD. Dutch Hospital Data [Available from: https://www.dhd.nl/Paginas/home.aspx.

14. RIVM. Wekelijkse SARI surveillance rapportage [Available from: https://www.rivm.nl/luchtweginfecties/sari/wekelijkse-sari-surveillance-rapportage.

16. ECDC-WHO. Flu News Europe [Available from: https://flunewseurope.org/.

17. ECDC. European Influenza Surveillance Network (EISN) [Available from: https://ecdc.europa.eu/en/about-us/partnerships-and-networks/disease-and-laboratory-networks/eisn.